Bulk Blending of Dry Fertilizer Materials for China

By James D. Beaton

Bulk blending is defined as the mechanical mixing of two or more granular fertilizer materials to produce mixtures containing nitrogen (N), phosphorus (P), potassium (K) and other essential plant nutrients. It allows small batches of high analysis soil and crop specific fertilizers to be mixed and transported in an economical manner...contributing additional profit for farmers and improving the environment because it provides balanced fertilization.

Acceptance and expansion of bulk blending in North America was phenomenal. From 1953 to 1957, bulk blend fertilizer factories increased from 14 to 92 in the state of Illinois. On a national basis, by 1980 there were between 5,000 to 5,300 bulk blend facilities in the U.S.A. and presently it is estimated there are about 7,500 facilities operational. Dry fertilizer blends accounted for 45.9 percent of all fertilizer sold in the U.S.A. in 1992. A similar trend occurred in Canada.

Bulk blending involves two vital components:

- Manufacture of high quality granular fertilizers by basic producers at large strategically located factories.
- Bulk transport of these materials to relatively small, local bulk blending factories for formulation of specific mixtures.

Bulk blends are 'prescription mixtures' based on specific soil and crop requirements. Soil testing helps establish recommendations for the blend. Fertilizer recommendations based on soil tests are agronomically and environmentally superior to those made without some knowledge of the soil fertility status of the fields to be fertilized.

Bulk blending requires materials that are well granulated, similarly sized and dry to prevent segregation, caking and deterioration. High quality bulk blended fertilizer has the following characteristics:

- Granular and free flowing.
- Components provide required plant nutrients homogeneously mixed.
- Free from segregation during handling.
- Quantities of nutrients reflect guaranteed analysis.
- Material is not dusty and is non-hygroscopic.

Bulk blending is popular because the process is easily accomplished, and investment cost for establishing the factory is relatively small. This generally results in savings for farmers purchasing the fertilizer. Blends are usually high analysis material that cut transportation costs. Prescription bulk blends are agronomically sound so that high profits from increased yields and quality are realized by the farmer.

Most modern blending facilities have 4.5 to 9 tonne capacity mixers. The former can produce up to 45 tonnes blended material per hour.

The major problems with bulk blending are segregation and methods of including secondary and micronutrients. Segregation can occur in storage bins due to coning action or from vibration. Standards exist for granule size and the acceptable degree of segregation. Secondary and micronutrients need to be sprayed on blended fertilizers, using a sticky substance.

Bulk blends are high quality granular materials.

Ingredients used to formulate bulk blends must be chemically compatible. Urea and ammonium nitrate should not be mixed because of wetting. Urea reacts with single superphosphate (SSP) and triple superphosphate (TSP) to release water, resulting in stickiness and caking. Ammonium bicarbonate will likely be a problem because it is unstable and decomposes to release ammonia, carbon dioxide and water. Diammonium phosphate (DAP) should not be mixed with SSP or TSP. However, DAP is well suited for blending with most N and K fertilizers. Most blends use urea, DAP and potassium chloride (KCl) as sources for the three major plant nutrients.

While ammonium bicarbonate and SSP are commonly used fertilizers in China, they are not recommended for bulk blending. Their use will result in blends that are dusty, subject to caking and of low and inaccurate analysis so that they are generally unsatisfactory to farmers.

There is a great future for bulk blending in China because it is a proven, practical and economically attractive method of practicing balanced fertilization. BCI

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